SYMONS'S

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THE WINTER OF 1878-9.

We have been favoured by Mr. F. Slade, C.E., of Barrow, with copies of a very interesting diagram representing the observations made at his station in North Lancashire during last winter, and he has added considerably to its value by the information contained in the following explanatory letter. Mr. Marshall takes up the subject in another form illustrative of the meteorology of the West Riding of Yorkshire; and finally, we add a few data respecting the weather experienced in the North of London during the past winter, and the twenty winters immediately preceding it.

THE WINTER OF 1878 AND 1879.

To the Editor of the Meteorological Magazine.

SIR,—It will be necessary to say a few words in explanation of the weather diagram which accompanies this letter. The arrows on the top point to the direction *from* which the wind blows. The velocity of the wind was registered by a Robinson's Anemometer. The figures underneath represent for the months of November and December, the force in lbs. per superficial foot at 8 a.m. and 5 p.m. The anemometer not being in use for January and February, the Beaufort scale was adopted. The barometer readings are from a Fortin's Standard Barometer, and corrected to 32° Fahr. and sea level. The maximum and minimum self-registering standard thermometers are enclosed in a Stevenson's Screen, four feet above the ground. The dotted blue line represents the minimum temperature registered by a radiation thermometer on the grass. The rain gauge

is 8 inches in diameter, 2 feet above the ground and 60 feet above sea level; and the snow collected in the gauge was melted and registered as rain.

The winter may be said to have commenced on the 11th of November. On that day snow fell from 11.30 a.m. to 4 p.m., leaving a layer on the ground fully 4½ inches in depth; but it was not till the 25th that the severe frost set in which continued, with two intermissions (of the last three days in December, and the 14th and 15th of January), till the 5th of February, or more than ten weeks. Another fall of snow took place from 4 a.m. to 7 a.m. on the 12th December, covering the ground to the depth of 2 inches. This was followed by frequent storms of snow and sleet during the next fortnight. The coldest period was from the 13th to the 17th December; on the latter day the minimum thermometer registered 16° Fahr. During this period we were enveloped in a thick fog, with constant showers of sleet and fine rain, which covered the upper surface of everything exposed to it with rime, and the thin coating of glazed ice on the branches and twigs of the trees and shrubs produced a very rare and beautiful phenomenon. The following week the roads were covered with a sheet of ice, and on Christmas Day a very heavy fall of snow took place, commencing at 8 p.m.; the next morning it lay 6 inches deep on the ground. This apparently cleared the atmosphere. On the 28th a thaw set in, and on the 30th the snow which had lain on the ground since the 12th, had quite disappeared. The frost set in again on New Year's Day. On the afternoon of the 12th of January there was a heavy fall of snow, which turned to rain at 8 p.m. The following day was mild, and a general thaw took place. On the 16th the severe frost returned, and continued to the 5th of February, during which time the roads were covered with snow and ice. We had then a period of warm genial weather. From the 18th to the 26th of the month the nights were frosty and the wind bitterly cold.

The following table gives the temperature for the four months:—

	1878.		1879.		Mean of the four months, Nov. to Feb.
	Nov.	Dec.	Jan.	Feb.	
Mean max.	44°·9	38°·0	36°·4	41°·9	40°·3
Mean min.	34 ·7	28 ·3	28 ·4	33 ·4	31 ·2
do. on grass	31 ·4	25 ·5	25 ·4	31 ·1	28 ·3
Mean temp. of air	39 ·8	33 ·2	32 ·4	37 ·6	35 ·8
No. of nights below 32°	20	27	29	16	Total... 92

This has been an exceptionally severe winter for Barrow-in-Furness.—Yours truly,

FREDK. SLADE.

Barrow-in-Furness, March 31st, 1879.

To the Editor of the Meteorological Magazine.

SIR,—The results of Mr. Stow's thermometrical observations during the past winter, which you published in your magazine for this month, would have been more interesting if similar results for previous winters had been added for comparison. As regards some of the principal items given by him, I have an account for the five previous as well as the last winter here, and I send you with this a copy for use in case you should think it worth notice. Mr. Stow's figures arranged in the same form show a very similar result for the past winter at Aysgarth and here, and are more nearly alike, I think, than could have been expected.

H. C. MARSHALL.

Weetwood Hall, Leeds, March 25th, 1879.

Weetwood Hall, Leeds. 400 *feet above Sea Level.*

	November.					December.					January.					February.					Summary of 4 Months.				
	Extremes.		Mean Daily.			Extremes.		Mean Daily.			Extremes.		Mean Daily.			Extremes.		Mean Daily.			Extremes.		Mean Daily.		
	Max.	Min.	Max.	Min.	Mean	Max.	Min.	Max.	Min.	Mean	Max.	Min.	Max.	Min.	Mean	Max.	Min.	Max.	Min.	Mean	Max.	Min.	Max.	Min.	Mean
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
1873–74 ...	54	28	46·0	36·7	41·4	54	25	45·3	36·3	40·8	51	29	45·0	34·9	40·0	48	21	42·1	31·4	36·8	54	21	44·6	34·8	39·7
1874–75 ...	56	25	44·6	34·9	39·8	46	13	35·1	26·2	30·6	51	17	44·0	36·0	40·0	50	22	38·6	30·8	34·7	56	13	40·6	31·9	36·3
1875–76 ...	55	29	43·9	35·1	39·5	52	24	41·7	34·6	38·1	52	20	40·5	32·2	36·3	54	25	43·8	33·7	38·7	55	20	42·5	33·9	38·2
1876–77 ...	53	27	44·7	35·6	40·1	52	27	43·5	35·9	39·7	55	27	43·3	33·3	38·3	51	19	45·5	34·9	40·2	55	19	44·2	34·9	39·6
1877–78 ...	55	29	46·9	36·9	41·9	49	23	42·7	34·5	38·6	51	23	41·6	34·0	37·8	56	26	44·6	35·6	40·1	56	23	43·9	35·2	39·6
5 years ...	56	25	45·2	35·8	40·5	54	13	41·6	33·5	37·6	55	17	42·9	34·1	38·5	56	19	42·9	33·3	38·1	56	13	43·2	34·1	38·7
1878–79 ...	46	26	41·4	32·1	36·7	48	9	34·3	25·5	29·9	44	18	33·6	24·8	29·2	49	23	39·2	31·3	35·2	49	9	37·1	28·4	32·7

Aysgarth Vicarage, Bedale. 660 *feet above Sea Level.*

1878–79 ...	47·6	26·0	40·7	32·0	36·1	48·0	7·2	34·7	24·1	29·5	45·0	10·6	33·6	23·9	28·7	47·3	20·0	36·8	29·6	33·2	48·0	7·2	36·4	27·4	31·9

Winter Temperatures observed at Camden Town by G. J. Symons, F.R.S.

Winters.	November.					December.					January.					February.					Summary of 4 Months.				
	Extremes.		Mean Daily.			Extremes.		Mean Daily.			Extremes.		Mean Daily.			Extremes.		Mean Daily.			Extremes.		Mean Daily.		
	Max.	Min.	Max.	Min.	Mean	Max.	Min.	Max.	Min.	Mean	Max.	Min.	Max.	Min.	Mean	Max.	Min.	Max.	Min.	Mean	Max.	Min.	Max.	Min.	Mean
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
1858–59 ...	56·0	20·1	46·0	33·6	39·8	52·5	24·4	44·5	34·6	39·6	52·6	27·0	44·8	34·2	39·5	57·9	28·7	49·3	35·6	42·5	57·9	20·1	46·1	34·5	40·3
1859–60 ...	59·2	24·3	48·0	36·4	42·2	56·4	14·4	40·8	31·6	36·2	54·8	27·2	44·7	35·0	39·9	52·4	23·2	41·2	30·3	35·7	59·2	14·4	43·7	33·3	38·5
1860–61 ...	53·2	31·2	46·0	36·2	41·1	53·5	6·7	40·5	32·1	36·3	52·4	24·4	38·4	28·9	33·6	54·7	23·2	47·6	36·8	42·2	54·7	6·7	43·1	33·5	38·3
1861–62 ...	57·6	21·8	47·3	34·2	40·7	53·2	21·6	45·7	35·1	40·4	55·3	18·1	43·5	33·7	38·6	56·1	23·2	45·7	36·9	41·3	57·6	18·1	45·5	35·0	40·3
1862–63 ...	56·9	23·7	43·9	34·4	39·2	54·3	30·3	47·0	38·5	42·7	53·7	26·7	46·2	37·6	41·9	53·6	24·5	48·0	36·0	42·0	56·9	23·7	46·3	36·6	41·4
1863–64 ...	59·5	27·3	50·7	40·1	45·4	53·9	26·4	48·7	36·9	42·8	53·8	15·1	41·0	32·5	36·8	54·4	18·9	42·0	31·4	36·2	59·5	15·1	45·6	35·2	40·4
1864–65 ...	54·5	26·2	48·8	35·3	42·1	51·5	17·8	42·3	34·4	38·3	50·8	18·0	40·9	31·5	36·2	52·8	15·4	38·4	32·3	35·4	54·5	15·4	42·6	33·4	38·0
1865–66 ...	57·0	31·2	50·6	40·0	45·3	52·5	30·8	46·5	38·5	42·5	54·2	22·7	47·6	38·3	42·9	55·8	25·2	47·2	36·1	41·6	57·0	22·7	48·0	38·3	43·1
1866–67 ...	62·4	27·4	51·0	38·4	44·7	56·5	27·3	48·1	37·9	43·0	56·0	6·7	39·7	29·3	34·5	56·2	30·0	54·3	40·2	47·3	62·4	6·7	48·3	36·4	42·5
1867–68 ...	62·6	26·4	47·7	35·9	41·8	54·9	22·5	42·3	32·5	37·4	53·0	23·4	41·5	33·0	37·3	62·5	26·6	50·1	38·3	44·2	62·6	22·5	45·4	35·0	40·2
1868–69 ...	59·3	25·4	47·2	36·5	41·9	58·2	31·5	50·7	41·0	45·9	56·3	25·0	46·3	35·9	41·1	60·8	31·3	51·7	40·6	46·1	60·8	25·0	49·0	38·5	43·8
1869–70 ...	58·2	27·6	49·1	37·4	43·3	57·7	20·8	43·3	33·3	38·3	51·7	21·2	43·4	34·4	38·9	54·9	20·1	41·8	32·4	37·1	58·2	20·1	44·4	34·4	39·4
1870–71 ...	56·4	27·3	48·0	36·2	42·1	57·2	14·0	38·3	29·9	34·1	45·2	19·7	37·4	29·5	33·4	56·2	25·8	48·1	37·5	42·8	57·2	14·0	42·9	33·3	38·1
1871–72 ...	52·5	21·0	43·6	32·8	38·2	49·0	20·1	42·7	34·2	38·5	52·8	27·4	46·1	36·3	41·2	57·0	31·4	51·1	39·3	45·2	57·0	20·1	45·9	35·6	40·8
1872–73 ...	61·2	31·7	50·9	40·2	45·5	54·6	26·6	47·0	38·2	42·6	53·9	28·4	46·7	38·3	42·5	50·1	25·8	39·5	31·3	35·4	61·2	25·8	46·0	37·0	41·5
1873–74 ...	58·1	27·7	50·1	38·8	44·5	56·7	22·9	45·8	35·8	40·8	55·4	28·0	47·4	35·9	41·6	54·5	22·4	44·8	33·3	39·1	58·1	22·4	47·0	36·0	41·5
1874–75 ...	60·0	25·6	47·4	36·9	42·2	53·8	18·4	38·1	28·7	33·4	53·8	20·7	48·2	39·2	43·7	51·2	25·1	40·8	31·0	35·9	60·0	18·4	43·6	33·9	38·8
1875–76 ...	58·8	29·0	48·1	37·2	42·7	54·8	23·2	42·9	34·8	38·8	54·8	18·9	42·5	31·5	37·0	58·6	23·0	46·7	36·6	41·6	58·8	18·9	45·0	35·0	40·0
1876–77 ...	61·4	27·6	49·7	38·8	44·2	56·6	28·0	47·8	40·4	44·1	56·4	28·5	48·5	37·4	43·0	58·5	25·3	49·4	38·6	44·0	61·4	25·3	48·9	38·8	43·8
1877–78 ...	59·1	31·2	52·3	39·6	45·9	54·2	28·3	45·6	35·5	40·5	55·6	26·9	45·2	35·5	40·4	59·7	25·7	47·7	37·7	42·7	59·7	25·7	47·7	37·1	42·4
20 Yrs. Max...	62·6	31·7	52·3	40·2	45·9	58·2	31·5	50·7	41·0	45·9	56·4	28·5	48·5	39·2	43·7	62·5	31·4	54·3	40·6	47·3	62·6	25·8	49·0	38·8	43·8
20 Yrs. Min....	52·5	20·1	43·6	32·8	38·2	49·0	6·7	38·1	28·7	33·4	45·2	6·7	37·4	28·9	33·4	50·1	15·4	38·4	30·3	35·4	54·5	6·7	42·6	33·3	38·0
20 Yrs. Mean..	58·2	26·7	48·3	36·9	42·6	54·6	22·8	44·4	35·2	39·8	53·6	22·7	44·0	34·4	39·2	55·9	24·7	46·3	35·6	40·9	58·7	19·1	45·8	35·5	40·7
1878–79 ...	53·5	29·4	44·9	34·8	39·9	55·2	18·7	38·2	29·5	33 9	51·0	19·2	35·8	28·7	32·2	53·8	25·2	43·0	34·0	38·5	55·2	18·7	40·5	31·7	36·1
Diff. from Mean ...	−4·7	+2·7	−3·4	−2·1	−2·7	+·6	−4·1	−6·2	−5·7	−5·9	−2·6	−3·5	−8·2	−5·7	−7·0	−2·1	+·5	−3·3	−1·6	−2·4	−3·5	−·4	−5·3	−3·8	−4·6

The value of the preceding summary of the temperature of twenty-one consecutive winters will be increased by the addition of a few facts respecting the instruments and their position, and also by a few remarks upon the leading peculiarities revealed by the table.

First as to the instruments. None but verified ones have been used, and the same minimum thermometer has been used throughout the whole period. One maximum thermometer was broken, but both it and its successor were absolutely without error. All the observations have been made with the thermometers upon a Glaisher's stand, or more strictly on Glaisher's stands, for the wood of the first perished and a new one identical in dimensions was substituted. The position of the stand has been changed twice, but all three stations are within a circle a quarter of a mile in diameter, and the ground is at the same altitude within 10 feet.

The remarkable feature of the winter of 1878-79 was its persistent low temperature. We have had colder Novembers, colder Decembers, and colder Februarys, but take the three consecutive months November to January, and there is no equal during the twenty years. The mean for those three months during the twenty years is 40°·5, the mean during 1878-79 was only 35°·3, or 5°·2 less than the average, and 1°·2 less than in 1870-71, the coldest winter of the twenty.

But the continuance of the cold through February adds to the exceptional features of the season. The mean temperature of February is 40°·9, but in 1879 it was 2°·4 lower, and although there have been, as already mentioned, colder Februarys, *e.g.* 1873, when the mean was only 35°·4, yet there have only been six colder ones during twenty years.

Lastly, if we take the long period of four months, November to February, both inclusive, we find that there is no winter of which the mean temperature has been so cold by nearly two degrees as in the one which we have just passed through.

As the long continuance of the cold is such as rarely to have been equalled, we think that it would be useful if one general table were compiled from all the British stations using verified instruments placed in Stevenson's screens, the table to contain precisely the data selected by Mr. Marshall. There would be no harm in giving a second table compiled from observations made with instruments presumed to be correct, but not actually verified, and also with others verified, but not in Stevenson's screens. Those who may be willing to supply data for such a table are requested to give full particulars both as to the instruments and their position, and to send them before May 1st.

COWL AND ANEMOMETER TESTING AT KEW OBSERVATORY.

WE mentioned last year that a series of comparisons was being made in the experimental house at Kew upon the merits of certain so-called suction cowls, intended to draw air up tubes on the top of which they were placed.

The experimental house is a barn-shaped structure of wood. Several tubes were taken through the ridge, and down to 3 ft. or 4ft. above the ground. A cup anemometer was placed at one end of the building arranged to read inside. The various cowls were placed on the top of the pipes, and, the only supply of air being from one open plank the whole length of the building, it was considered that the pipes had equal advantages; as, however, the draught up the tubes varied with the direction of the wind, care was taken that the pipe bearing each cowl when it was being specially tested should have an open one on each side of it, and we believe also that comparisons during which the direction changed were rejected. The velocity of the current up each air pipe was measured by the usual small air meter. Finally the following report was issued:—

"The Sub-Committee appointed at Leamington to test the ventilating Exhaust Cowls beg to report that they have given the matter their most careful attention, and carried out at the Royal Observatory, Kew, an elaborate series of about 100 experiments, on seven different days, at different times of the day, and under different conditions of wind and temperature. After comparing the Cowls very carefully with each other, and all of them with a plain open pipe as the simplest and in fact only available standard, the Sub-Committee find that none of the Exhaust Cowls cause a more rapid current of air than prevails in an open pipe under similar conditions but without any cowl fitted on it. The only use of the Cowls, therefore, appears to be to exclude rain from the ventilating pipes, and as this can be done equally if not more efficiently in other and simpler ways, without diminishing the rapidity of the current in the open pipe, the Sub-Committee are unable to recommend the grant of the medal of the Sanitary Institute of Great Britain to any of the Exhaust Cowls submitted to them for trial.

W. EASSIE.
ROGERS FIELD.
May 30th, 1878. DOUGLAS GALTON."

In our previous notice we expressed the belief that the experiments would throw some light upon the influence of the shape and aspect of buildings, upon the indications of anemometers placed upon them, and we believe that that was the case, although the above report gives no information. Moreover, we believe that the experiments have already led to some important modifications respecting air meters, and to the investigation of some points in the construction of anemometers. We understand that the Council of the Sanitary Institute

have passed a resolution re-appointing Captain Douglas Galton, C.B., F.R.S., Rogers Field, B.A., M. Inst. C.E., and W. Eassie, C.E., as a Committee to further investigate the whole subject of ventilation by automatic means, and to extend the enquiry to other appliances for ventilation besides those already submitted to trial, with a view to the publication of the detailed results. By permission of the Kew Committee of the Royal Society the experiments will be carried out at Kew Observatory.

The expense of the contemplated inquiry will be considerable, and the Sanitary Institute have not at the present time funds available for this purpose. It is therefore proposed to raise the requisite fund by special subscription among those interested in the thorough investigation of the subject.

Subscribers of a guinea and upwards will be entitled to receive a copy of the detailed results of the experiments when published.

Subscriptions to be forwarded to Rogers Field, Hon. Treasurer, 5, Cannon Row, Westminster, and cheques crossed London and Westminster Bank. About £160 has already been subscribed in sums ranging from £100 to £1 1s. 0d.

There can be no doubt as to the importance of the subject; the committee is a small one and calculated to ensure confidence; the report will be pretty certain to contain details of value; and, therefore, we think that few will find the investment of a guinea (or more) a bad speculation.

THE PREVALENCE OF FOGS.

To the Editor of the Meteorological Magazine.

SIR,—In your notice of "The Fenland, Past and Present," vol. xiii. p. 135, you expressed some astonishment at the figures given in a table, on the *prevalence of fogs* in the Fens, and said "We do not remember ever seeing a table of prevalence of fogs." Some little discussion followed that review, in which it was stated that a record of fogs was being continued in the district.

I do not write to re-open that discussion, but to state what has been observed, and with a view to induce your numerous correspondents, and meteorologists generally, to give publicity to their records on this subject; for it has occurred to me that fogs and the various phenomena attending them are not sufficiently discussed. Great disasters both by land and sea occur when we are enveloped by them, and it might be as important often to give warnings of the approach of fogs as of gales, and if they are found in certain localities to accompany anticyclones, or any determined atmospheric condition, we should be warned of their approach as we are now of that of a cyclone.

But I must now confine my remarks to records of fogs made for me by Mr. James Long, of Wisbech, and to those made at my station

at Lowestoft, and simply to the dates of their occurrence. I trust others will give records for comparison, so that a more general discussion of them and their attendant phenomena may result in the future.

Fogs at Wisbech, Nov. and Dec., 1878.

Nov. 19.	Thick, all day.	Dec. 13.	Very dense fog all day, objects invisible at 45 yards.
,, 20.	Do. do.	,, 16.	Very foggy all day.
,, 24.	Do. do.	,, 20.	Fog and frost.
,, 27.	Do. do.	,, 25.	Fog all day.
Dec. 1.	Thick, p.m.		
,, 7.	Do. do.		
,, 10.	Rather foggy, snow.		

1879.—Jan. 1st to March 31st. No fog.

Fogs at Lowestoft, Nov. and Dec., 1878.

Nov.	None.	Dec. 16.	Slight, all day.
Dec. 7.	Slight, a.m.	,, 26.	Do. do.
Dec. 12.	Slight, all day.	,, 27.	Thick, all day.

1879.—Jan 12–13. Slight.
Feb. 2. Thick, 7 p.m., for 15 hours.
March 31. Slight, a.m.

Yours faithfully, S. H. MILLER.

Belle Vue Park, Lowestoft, 4th April, 1879.

THE EXTRAORDINARY METEOR OF MARCH 24TH.

To the Editor of the Meteorological Magazine.

SIR,—The meteor described in your last number was observed also at March. A brilliant flash of light was seen, and after a short time it was followed by a noise like an explosion. A policeman on duty in the High Street was greatly alarmed by the light, and described the noise as a low rumbling sound like distant thunder, which made the ground tremble and shook several windows; while the light lasted, which was only for a few seconds, everything was illuminated. Superintendent Burrows saw a most brilliant light, which appeared to him to burst in the air, followed by the rumbling sound.—Yours truly,

JAMES GREEN.

The Cross, March.

FROST PHENOMENA.

To the Editor of the Meteorological Magazine.

DEAR SIR,—Doctors differ. I have been a cultivator of the soil for close on half a century, and I must say I agree with Mr. Bicknell and not with Mr. Mathison. I have never been so free from slugs as this year, and I usually suffer severely from them. Even the Scilla Siberica, which has usually been cut off almost before it came through the ground, is untouched, though nothing has been done to

protect it, and all the larkspur family, which I have usually to take means to preserve, are being let alone. The slugs are of course not extinct, but they have manifestly been severely thinned.

Yours truly,

THOS. WARING.

Waringstown, Co. Down, April 4th, 1879.

REVIEWS.

Instructions to Observers connected with the Meteorological Service of the Dominion of Canada. By G. T. KINGSTON, M.A., Superintendent. Toronto: Copp, Clark & Co. xviii., 190 pages, 8vo.

ALTHOUGH we are becoming more and more convinced that disproportionate attention is at present bestowed upon the making of meteorological observations, we regard with great satisfaction the rapid succession of volumes instructing observers how to observe and record accurately.

"In Part I. are given the meaning of terms in frequent use, and simple statements of sundry physical facts to which reference is made in subsequent parts of the volume, or of which a knowledge would be useful in reading works on Meteorology." This part is, in fact, a sort of small treatise on Physics, for we have definitions, specific gravity, laws of fluids, heat, principle and construction of thermometers, expansion, specific heat, &c.

The second part treats of the construction and use of Meteorological Instruments, with brief descriptions of certain phenomena. We quote the first section as a specimen of the author's style :—

Measurement of Atmospheric Pressure.—The pressure of the atmosphere at any time and place may be measured by the number of units of pressure exerted by the atmosphere on a unit of surface; for example, by the number of pounds on the square inch. It is customary, however, to measure the atmospheric pressure by the *depth* in inches of mercury in a vessel at the base of which the pressure referred to a unit of surface is the same as the pressure of the air, where the pressure on the upper surface of the mercury is supposed to be nothing, the density of the mercury, that proper to pure mercury at temperature 32°, namely, 13·598, and the force of gravity that which exists at the mean level of the sea in latitude 45°.

This paragraph sufficiently indicates how careful has been the writing of this book, and how careful must be the reading of it. The book is pre-eminently solid and thorough, and although we fear that few observers would thoroughly master it without a headache or two, there is not a shadow of doubt that they would be extremely well instructed.

The observers are (most properly) directed to write all figures, letters and words in a plain, distinct manner, *without flourishes;* never to use vulgar fractions (*i.e.*, never to put $10\frac{1}{2}$, but always 10·5); and, further, that—

Returns of every kind should be carefully compared with the originals by *two persons*, one of whom should read aloud while the other corrects; the

latter of the two operations being done by the more experienced person of the two. The practice enjoined in this article is very important, and one to which, it is feared, sufficient attention has not be given by some correspondents.*

The most serious omission which we notice is that of any remarks upon care in the arithmetical operation of adding and meaning the columns, inaccuracy in which is very prevalent and involves one of two evils—either *delay* pending correspondence with the observer, or *guessing* at the chief office, for it is never possible to determine by inspection whether the error arises from a wrong entry or wrong addition.

In one respect we cannot agree with Prof. Kingston. His staff of observers seem to have a very miscellaneous collection of rain gauges, and this has apparently induced Prof. Kingston to abandon as undesirable the usual course, of supplying measuring jars adapted to the gauges, and instead of so doing, to issue jars divided in cubic inches, leaving to each observer to determine the area of the funnel which he uses, and then to compute the rainfall represented by each tenth of a cubic inch of water collected. As no reference is made to the observers being provided with standard measures of length, and the accurate measurement of the diameter of a rain gauge without a proper tool is not easy, we doubt if the observers determine the area correctly; moreover, no examination of the accuracy of their calculations seems to be made. If so, surely these two sources of error are more dangerous than the risk of sending a 5-inch jar to a station provided with an 8-inch gauge, for the former is an error easily overlooked, the latter so gross that it could hardly escape detection.

We are glad to conclude by calling attention to one feature in this book, which is as good as it is original, viz., a series of photographs of the instruments in position. In a country where the funds are insufficient for frequent inspection, and where the distances between the stations are often very great, it is especially necessary to render the observers as independent of oral instruction as is possible. These photographs must be quite a boon to many of the observers, and all will thank Prof. Kingston for them. The thermometer stand also appears to us very admirable, but we dare not raise that subject in these pages.

Negretti and Zambra's Encyclopœdic Catalogue. London: Negretti and Zambra. viii.–564 pages.

FOR some reason which it is beyond our power even to guess, this volume does not state upon its title page that it is a second edition. There is, however, no doubt about the fact, nor is there any doubt that it is improved and enlarged. Indeed, as to size, binding, and some other points, it seems to be intended to compete with that literary Leviathan, the Post Office London Directory.

* Although the greater part of the volume is extremely free from misprints, there is evidence on page 131 that the above rule was either neglected wholly or in part, even in reading the proofs of these instructions, for there are three wrong values under 29·2, and there is one under 29·3.

Of course, out of so large a volume we could, if it were worth while, collect a grand series of errors; in such a work it is not possible to avoid them, but except quite trivial ones, we have seen few. There is, however, a muddle on pages 205, 6, 7, 9, and 210, where the reference numbers (674 to 693) are used twice over. On page 518 there is a wonderfully droll statement—viz., that a cubic foot of snow weighs 63 lbs. 14 oz. As this is rather more than it would weigh if it were the most dense ice, its inaccuracy is obvious. As Messrs. Negretti give the authority, we must not blame them for the blunder, which occurs originally in the *Instructions* published by Col. Sir H. James—appendix, page 30—where one foot should be ten feet!

The great merit of this catalogue is, that it combines two advantages. As a catalogue it is as nearly perfect as one can expect any catalogue to be, in days when new inventions are more plentiful than gooseberries; and in illustration of, and supplementary to, the descriptions of the instruments, it is becoming quite a mine of short notices, many of which are extremely good. We may quote as illustrating and justifying this statement, the article on Aneroids (pp. 14–17) and the remarks (p. 158) upon the saltness of sea water.

FRENCH HYDRAULICS.

In the spring of 1878 an important commission was appointed by the French Government, to collect and concentrate all available data respecting the régime of the rivers of France, with especial reference to the prevention of floods. We are glad to see the following note in the *Times* of April 8th, and hope before long to receive the report, and lay an abstract of it before our readers.

"The Water Commission is about to consider the means of preventing floods, and an able report has been presented to it by M. Faré, ex-Director-General of Forests, on the temporary absorption of rain by vegetation. He states that deciduous trees intercept 37 per cent. of the rainfall, and firs 55 per cent. A square metre of grass 8 inches thick will absorb 50 kilogrammes (110 lbs., or 2 inches deep) of water, or a volume one-fourth its size. He dwells also on the absorbing powers of the soil and roots of forests."

THE WEATHER IN MARCH.

During the whole of the first week of the month pressure was highest over the southern part of Western Europe, and depressions passed from S.W. to N.E., and from W. to E. over, or near to, our northern and western coasts. At first these disturbances were important, and from the 2nd to the 5th S.W. to W. winds, strong to a gale in force, prevailed over the western and northern parts of this Island, with cloudy or dull weather. During the 6th and the succeeding night, however, the barometer rose decidedly, and from that day till the close of the week high and uniform pressures lay over England, Ireland and France, while in Scotland the gradients for westerly winds were slight. On the 8th pressure was giving way everywhere, and in the N. conditions were again becoming unsettled.

Considerable changes in the weather took place during the second week. On the 9th, though the mercury fell everywhere, a large anticyclone lay over the S. of the British Islands and neighbouring countries, and light to fresh W. breezes

prevailed, with exceedingly fine and warm weather. On the following day the area of uniformly high pressures was more to the southward of us, and the sky became cloudy generally with rain and snow in the west and north. In the S.E., however, the weather was still warm and fair. On the 11th, though the barometer was rising and the weather was fine, the isobars had taken a direction from N.W. to S.E., so that N. breezes had set in and temperature fallen. In the evening of that day the mercury was falling in the N., and by the next morning a complicated depression had advanced over Scotland, giving us strong W. winds in the S., and gales from the E., and snow in the N. This depression passed rapidly to the south-eastward, the wind veered to N., blowing very strong in the north-east and east; as it did so temperature fell rapidly, sharp frost being experienced in the N.

On the 13th an anticyclone lay over these Islands, but in the evening of the same day a small depression appeared on its north-western side, and gradually infringing on it, caused very cold wet snowy weather to prevail generally on the 14th. On the 15th, a band of low pressure lay across Scotland, giving us W. winds in the south, and E. winds in the north, with cloudy unsettled weather.

The distribution of pressure at the beginning of the latter half of March was rather complex, areas of high readings are shewn, one over the South of Scandinavia, stretching westward to the north of Scotland, and a second over the north of Italy, the south of France, and north of Spain, while a band of low pressure lay across England, Ireland, and the North Sea. Strong E. breezes prevailed in the north, and W. ones in the southern portion of Western Europe, the weather being unsettled and mostly cloudy.

During the night of the 16th, the bar. rose briskly over these Islands; and on the day following, an area of high pressure lay over the North Sea, with a small disturbance on our south-west coast, so that S. to S.E. breezes prevailed over the United Kingdom generally. By the 18th the anticyclone had moved south-eastward to North Germany, and readings were lowest to the westward of Ireland. On the 19th, however, pressure had become highest over Scandinavia, and lowest over the Peninsula, so that the wind backed to S.E. to E. generally. During the remainder of the third week of the month pressure continued highest in the north, and lowest in the south, and the prevailing current was E. to N.E. on nearly all coasts.

The weather, after being steadily cold and inclement during the greater part of the last week, became suddenly mild and warm at its close. On the 23rd, 24th and 25th, the highest pressures lay over the south of Scandinavia, and the lowest over the south-east of France; and strong E. breezes, drawing into S.E. in Scotland, and into N.E. over the Bay of Biscay, prevailed, uninterruptedly, with very low temperature for time of year; and on the 24th and 25th much snow and sleet. On the 26th a rather deep depression appeared off our south-western coasts, but the bar. still rose over the Gulf of Bothnia, so that gradients for S.E. winds increased, and the wind which had veered south-eastward generally rose to a fresh to hard gale in many places. This depression moved south-eastward, the wind consequently backed to E. and N.E. again, and temperature which had risen somewhat on the 26th and 27th fell again on the morning of the 28th. During the night of the 27th a very decided rise of the mercury occurred over the Bay of Biscay, and a large depression, which appeared on our south-western coasts during the 28th, moving slowly northward, caused S. gales in the west, with a quick rise of temperature. On the 29th the centre of the depression had reached the Hebrides, where the bar. had fallen 0·6 in.; while over France the mercury rose quickly. In consequence, gradients for W. to. S.W. winds appeared generally, and the weather became much milder.

Temperature was very changeable throughout the month. During the first week, when the wind blew from S.W. to S.E. generally, temperature was high, and the weather altogether very fine and dry. Considerable range was shewn during the second week, the maxima at the beginning being exceptionally high, and the minima at the end unusually low. The third week

was marked by considerable oscillations. It was highest on the 19th, when the ther. reached 64° in London and 68° at Cambridge, but after that date it fell steadily, and at the close of the week the weather had resumed its winterly character. Fogs were prevalent in the former part of the week. The temperature remained low till the 28th, when the wind changing to the south-westward, a good rise of temperature took place. No considerable fall of rain was reported on any day throughout the month. H.E.M.

SUPPLEMENTARY TABLE OF RAINFALL IN MARCH, 1879.

[For the Counties, Latitudes, and Longtitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 11 & 10.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Margate, Acol	·98	XI.	Port Madoc	2·50
,,	Littlehampton	·70	,,	Douglas.....	2·45
,,	Horsham, Swallowfield.	...	XII.	Carsphairn	5·14
,,	Hastings, Manor House	·90	,,	Melrose, Abbey Gate...	2·40
,,	Hailsham	·74	XIV.	Lanark, Baronald	...
,,	I. of W., St. Lawrence.	·80	XV.	Islay, Gruinart School..	...
,,	Strathfield Turgiss	·42	XVI.	St. Andrew's, Cambo...	...
III.	Great Missenden.....	·93	,,	Aberfeldy H.R.S.	3·51
,,	Winslow, Addington ...	1·19	XVII.	Tomintoul.....	...
,,	Oxford, Magdalen Col...	·98	,,	Keith H.R.S.	2·68
,,	Northampton	·83	,,	Forres H.R.S.	1·68
,,	Cambridge, Merton Vil.	·85	XVIII.	Strome Ferry H.R.S....	4·74
IV.	Harlow, Sheering	1·19	,,	Lochbroom	3·97
,,	Diss	·99	,,	Auchnasheen H.R.S. ...	1·94
,,	Swaffham	1·05	,,	Tain, Springfield.....	2·94
,,	Hindringham	·75	,,	Looh Shiel, Glenfinnan.	8·47
V.	Salisbury, Alderbury...	·40	,,	Dalwhinnie H.R.S.....	3·53
,,	Calne, Compton Bassett	·85	XIX.	Lairg H.R.S.	...
,,	Beaminster Vicarage ...	·65	,,	Altnabreac H.R.S.	...
,,	Dartmoor Prison.....	3·28	,,	Watten H.R.S.	1·66
,,	Langtree Wick	1·05	XX.	Fermoy, Glenville	1·96
,,	Lynmouth, Glenthorne.	1·27	,,	Tralee, Godfrey Place...	...
,,	St. Austell, Cosgarne...	1·43	,,	Cahir, Tubrid	1·30
,,	Taunton	·76	,,	Tipperary, Henry St....	1·86
VI.	Bristol, Ashleydown ...	1·02	,,	Newcastle West	1·47
,,	Wem, Sansaw Hall.....	1·62	,,	Kilrush	1·69
,,	Cheadle, The Heath Ho.	1·10	,,	Corofin	2·60
,,	Bickenhill Vicarage ...	...	XXI.	Kilkenny, Butler House	1·67
VII.	Melton Mowbray	·68	,,	Ballymore, Eustace ...	...
,,	Horncastle, Bucknall...	·53	,,	Kilsallaghan.....	2·45
VIII.	Walton-on-the-Hill.....	1·20	,,	Navan, Balrath	1·92
,,	Broughton-in-Furness..	3·15	,,	Athlone, Twyford	1·97
IX.	Wakefield, Stanley Vic.	1·04	,,	Mullingar, Belvedere...	...
,,	Ripon, Mickley	1·69	XXII.	Ballinasloe	2·63
X.	Gainford	1·19	,,	Clifden, Kylemore	5·37
,,	Haltwhistle, Unthank..	2·55	,,	Crossmolina, Enniscoe..	...
,,	Shap, Copy Hill	5·36	,,	Carrick-on-Shannon ...	2·89
XI.	Llanfrechfa Grange	1·76	,,	Dowra	2·47
,,	Llandovery	3·13	XXIII.	Rockcorry.....	2·27
,,	Solva	·80	,,	Warrenpoint	1·96
,,	Castle Malgwyn	...	,,	Newtownards	2·25
,,	Rhayader, Nantgwillt..	4·00	,,	Larne, Carnlough	3·47
,,	Carno, Tybrittle	3·06	,,	Bushmills	1·72
,,	Corwen, Rhug	...	,,	Buncrana, Rockfort ...	2·18

MARCH, 1879.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Dpth	Date.	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date.	Min. Deg.	Date.	No. of Nights below 32°. In shade.	On grass.
			inches	inches.	in.								
I.	ENGLAND.	Camden Square	·91	— 1·17	·14	18	14	63·1	19	29·2	2	11	15
II.		Maidstone (Hunton Court)	·57	— 1·59	·12	30	9	...	...	...	...	...	...
,,		Selborne (The Wakes)	·73	— 1·87	·27	30	7	60·0	19	23·0	8	11	20
III.		Hitchen	·62	— 1·55	·15	30	13	57·0	19	26·0	12	16	...
,,		Banbury	1·02	— 1·18	·19	28	18	59·0	19	25·0	2	18	...
IV.		Bury St. Edmunds (Culford)	·84	— 1·36	·18	10	11	60·0	19†	25·0	1	17	24
,,		Norwich (Sprowston)	...	...	...	...	...	...	...	...	...	...	...
V.		Bridport	·45	— 2·42	·13	29	8	...	...	...	...	...	...
,,		Barnstaple	·78	— 2·37	·23	16	12	62·0	20	28·0	14	...	...
,,		Bodmin	1·28	— 2·47	·32	28	20	60·0	19	28·0	2	9	18
VI.		Cirencester	1·24	— 1·36	·24	28	15	...	...	...	...	...	...
,,		Shifnal (Haughton Hall)	·89	— 1·05	·17	16	15	54·0	5‡	23·0	2	15	21
,,		Tenbury (Orleton)	·81	— 1·61	·10	28	15	60·2	9	22·3	2	14	19
VII.		Leicester (Town Museum)	·68	...	·12	28	14	61·0	19	26·6	8	9	22
,,		Boston	·54	— 1·25	·12	26	10	65·0	19	27·0	13	11	...
,,		Grimsby (Killingholme)	·99	...	·14	28	15	55·0	9, 12	25·0	14	5	...
,,		Mansfield	·97	...	·27	26	15	57·5	9	26·8	13	12	15
VIII.		Manchester (Ardwick)	1·89	— ·55	·40	16	16	55·0	8¶	28·0	2	11	...
IX.		York	·80	— 1·19	·13	13	13	57·5	19	25·0	14	9	15
,,		Skipton (Arncliffe)	4·02	— ·79	·77	15	24	...	...	...	...	...	...
X.		North Shields	·80	— 1·55	·26	15	15	55·0	5	20·0	14	10	10
,,		Borrowdale (Seathwaite)	12·14	— 1·26	1·93	2	17	...	...	...	...	...	...
XI.	WALES.	Cardiff (Crockherbtown)	1·14	...	·32	28	14	60·0	19	28·4	2	6	...
,,		Haverfordwest	1·72	— 1·73	·49	16	7	60·0	19	22·5	2	14	19
,,		Aberdovey	...	...	...	...	...	...	...	...	...	...	...
,,		Llandudno	1·46	— ·80	·32	16	12	54·8	8	28·0	26	5	...
XII.	SCOTLAND.	Cargen	2·84	— ·26	·42	18	16	55·0	7	21·0	14	8	...
,,		Hawick (Silverbut Hall)	2·65	...	·47	15	18	...	...	...	...	...	...
XIV.		Annanhill	2·86	...	·66	4	16	53·0	9	23·0	14	14	18
XVI.		Kilmory	5·73	...	1·55	14	20	...	...	22·0	13	21	...
,,		Mull (Quinish)	3·15	...	·54	4	17	...	...	...	...	...	..
,,		Loch Leven	...	...	...	...	...	...	...	...	...	...	...
,,		Tyndrum (Ewick)	...	...	...	...	...	...	...	...	...	...	...
XVII.		Arbroath	2·62	+ ·58	·70	14	14	53·0	5, 9	25·0	14	9	...
,,		Braemar	3·51	+ 1·30	·75	14	19	48·2	19	21·0	14	19	25
XVIII		Aberdeen	...	...	...	...	...	...	...	...	...	...	...
,,		Portree	6·11	— 2·93	·97	3	19	...	...	...	...	...	...
,,		Inverness (Culloden)	2·57	+ ·61	...	...	...	52·3	4	16·2	16	...	...
XIX.		Dunrobin	2·22	— ·40	·50	4	15	56·0	7	21·0	17	11	...
,,		Sandwick	3·23	— ·10	·40	3	18	50·0	8	21·6	15	11	17
XX.	IRELAND.	Cork	1·47	...	·47	29	7	...	...	...	...	...	...
,,		Caherciveen Darrynane Abbey	1·56	...	·33	28	14	...	...	...	...	...	...
,,		Waterford	2·38	— ·51	·64	16	16	57·0	9	29·5	13	7	...
,,		Killaloe	2·28	— 2·04	·31	10*	14	62·0	19	23·0	28	15	...
XXI.		Portarlington	1·81	— 1·50	·38	16	24	54·0	8	27·5	25	12	..
,,		Monkstown, Dublin	1·58	— 1·00	·54	17	12	...	...	...	...	...	...
XXII.		Galway	2·16	...	·53	29	15	55·0	8§	28·0	24‖	9	...
XXIII		Waringstown	2·15	...	·31	17	24	57·0	7, 8	23·0	12	15	20
,,		Edenfel (Omagh)	2·05	...	·34	5	19	56·0	23	23·0	12	16	...
,,		Ballyshannon	...	...	...	...	...	...	..	...	...	...	...

* And 29. † And 29. ‡ And 12, 18, 19. § And 12, 20. ‖ And 26. ¶ 29, 31.

\+ Shows that the fall was above the average; — that it was below it.

METEOROLOGICAL NOTES ON MARCH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

SELBORNE.—A remarkably dry month; the wind very variable.

BANBURY.—High wind on five days, S on seven days, H on 30th. Violets in bloom on 28th.

CULFORD.—The month was generally cold and sunless, and vegetation is backward. Very little high wind; 23rd, 24th and 25th very cold, with E. and N.E. winds. Mean temp. 40°·7; polar winds prevailed on 14 days.

BODMIN.—T and L at 5 a.m. on 30th.

SHIFNAL.—March this year both came in and went out like a lamb, but bitter cold intervened, especially from the 22nd to the 29th, when the equinoctial gales coming from the E., with attempts to snow, were deadly cold. Snowdrops full out on 4th; rooks began to build on 6th; ringdove first heard on 17th; apricot in blossom on 29th; celandine flowers and hawthorn buds on 31st.

ORLETON.—Temperature variable, but generally low, with frequent strong drying winds, which were favourable for agricultural work on clay lands. Several bright days with severe frost at night in early part of month; L on the night of the 18th, when there was a TS at Ludlow, 14 miles distant. Lunar halos on 5th and 30th.

BOSTON.—Weather during part of the month intensely cold, with N.E. winds and S. Mean temp. about 1° above the average. The winter frosts and the drying winds got the land in very good order, and the spring seed has been well got in. The young wheat looks strong and healthy, much better than was anticipated.

GRIMSBY.—Very cold month; young lambs suffered from the cold and S, but the precipitation not being great, farm work made good progress. Two inches of S on the ground on 14th; high wind from 22nd to 26th; T and L on 30th; T and H on 31st. Lunar Halo on 30th.

MANCHESTER.—The month opened rather mild, but about the 20th the wind veered to E. and N.E., and the weather became cold. Slight falls of snow on 25th and 26th. T and L in afternoon of 25th.

YORK.—A good month for field and garden work, but vegetation very backward. TS on 30th.

WALES.

HAVERFORDWEST.—A bleak cold month. Rainfall only half the average. First and last weeks very severe, with easterly gales and S. Remarkably fine and warm on 18th and 19th.

SCOTLAND.

HAWICK.—March came in like a lion, and had very few lamb-like days. Hurricanes on 5th and 22nd. S fell to the depth of 7 in. on the 13th. Such a severe March has not been known for many years. Laurel bays have suffered severely, and celery, turnips, and all the brassica tribe, have been reduced to pulp.

PORTREE.—More frost in this month than has ever been known before. Gales on the 4th, 12th, and 30th. Lambs suffering greatly from the cold.

CULLODEN.—Vegetation very backward. Snowdrops, Crocuses, Christmas Roses, Aconitums, and Hepaticas, all late in flowering.

DUNROBIN.—The ground was hardly clear of S when on the 12th 9 in. fell, and 3 in. more on the 15th, putting a stop to most out-door work for the greater part of the month. The snowfall was succeeded by severe frost, which prevailed until the 18th, when thaw and cold E. winds set in.

SANDWICK.—During March there was generally a continuance of cold wintry weather, with S over the plains on nine days, and drift on two of them. There

were gales of 50 miles an hour on the 4th, 9th, and 29th; Auroræ on the 15th and 29th.

IRELAND.

DARRYNANE.—A very dry month, and mild, except from 23rd to 29th, which week was bitterly cold.

KILLALOE.—A good seasonable month, and generally favourable for agriculturists. Frosts rather frequent, and some S from 25th to 28th. Vegetation backward, and all flowering plants much later than usual.

MONKSTOWN.—A dry seasonable month with a good deal of slight frost. On the 22nd the wind shifted to N. and N.E., and continued from that quarter for about a week, with bitterly cold weather and showers of S and H; the last two or three days were fine and mild. Vegetation still very backward.

EDENFEL.—The month was extremely raw, harsh and ungenial. The easterly winds, which prevailed, instead of drying the ground and preparing it for seed, were almost always accompanied by S, sleet and R; consequently but little seed has been sown, and there is as little appearance of vegetation over the country as there was two months ago.

ERRATA.

THE following errata in the Monthly Tables printed in the *Meteorological Magazine* during 1878 have been discovered, by comparing them with the annual returns received from the same stations for the compilation of *British Rainfall*, subsequent correspondence with the observers having proved the amounts reported at the end of the several months to be incorrect.

REGULAR TABLE.

Maidstone (Hunton Court)	January	1·20	should be	1·26
Cirencester	January	1·25	,, ,,	1·77
Boston	August	5·31	,, ,,	5·48
Manchester (Ardwick)	February	·81	,, ,,	·88
,, ,,	March	·88	,, ,,	1·87
,, ,,	April	1·71	,, ,,	1·70
,, ,,	June	2·74	,, ,,	2·71
North Shields	May	1·89	,, ,,	1·95
Llandudno	October	3·62	,, ,,	3·78
,,	December	1·96	,, ,,	1·95

SUPPLEMENTARY TABLE.

Addington	October	2·14	should be	2·16
Langtree Wick	August	5·85	,, ,,	5·97
Mickley	February	1·43	,, ,,	1·47
Port Madoc	May	3·92	,, ,,	3·72
Gruinart	October	6·21	,, ,,	6·02
Ballinasloe	May	4·36	,, ,,	4·38

ANTICYCLONES AND FOG. (f = fog; m = mist. Extracted from the D.W. Reports.—During the anticyclones in March, fog or mist was reported as under (the names are arranged according to the height of the barometer):—During the anticyclone of March 9th, Lyons (30·56—f), Toulon (m), Cuxhaven (m), London (f), Prawle Point (m), Oxford (m), Yarmouth (m), Corunna (f), Donaghadee (m), Mullaghmore (30·29 m). On the 10th:—Lyons (30·58—f), Jersey (f), Scilly (f), Charleville (m), Prawle Point (m), Cape Gris Nez (f), London (f), Pembroke (f), Holyhead (m), Yarmouth (30·37—f). Similar conditions were shewn by the charts of March 13th, 14th, and 18th.